Appendix G

Glossary

303(d): Part of the *Clean Water Act.* If monitoring and assessment indicate that for some uses and/or parameters, a waterbody or segment is not meeting water quality standards due to pollutants, then that water is considered "impaired" and goes on a special list called the "303(d) list," named after the section of the *Clean Water Act* that calls upon states, approved tribes, and territories to create such lists.

305(b): Part of the *Clean Water Act.* Refers to a required national water quality inventory that provides an assessment of the condition of waterbodies and information on which pollutants (chemicals, sediments, nutrients, metals, temperature, pH) and other stressors (altered flows, modification of the stream channel, introduction of exotic invasive species) are the most common causes of impacts to waterbodies and what are the most common sources of those stressors.

Accuracy: A data quality indicator used by the U.S. EPA that shows the extent of agreement between an observed value (the sample) and the accepted, or *true value,* of the parameter being measured.

Algae: Simple aquatic plants that are usually microscopic in size. Algae can grow suspended in the water or attached to plants or the lake bottom. Algae do not have true roots, flowers, and leaves.

Algal bloom: A population explosion of algae in surface waters due to an increase in plant nutrients such as phosphorus.

Alkalinity: The capacity of a lake to neutralize acid.

Analyte: The property or substance to be measured, such as pH, dissolved oxygen, bacteria and heavy metals.

Bacteria: Microscopic single-cell organisms that are similar to plants but lacking in chlorophyll.

Benthic: Refers to being on the bottom of a waterbody.

Benthic Macroinvertebrates: Organisms that are large enough to be seen with the naked eye and lacking a backbone that are attached to or resting on the bottom or living in the bottom sediments of a waterbody.

Biological Monitoring (or biomonitoring): The use of a biological entity as a detector and its response as a measure to determine environmental conditions. Toxicity tests and biological surveys are common biomonitoring methods.

Biometrics: The results of the statistical analyses of biological observations and phenomena.

Biota: The living organisms of a region or area.

Bloom: A very large algal population that may cause a green coloration of the water or form large floating mats. Such a large population may be stimulated by high nutrient levels, warm-water temperatures and long periods of sunlight. Seasonal spring and fall algal blooms usually are part of the normal cycle of a productive lake.

Chlorophyll: The photosynthetic, green pigment contained in all green plants.

Clarity: The transparency of water, routinely estimated by the depth at which you can no longer see a Secchi disk. The Secchi disk is a 20 cm (8 inch) diameter weighted metal plate with alternating quadrants painted black and white that is used to estimate water clarity (light penetration). The disk is lowered into water on the shaded side of the boat until it disappears from view. It is then raised until just visible. That depth is recorded as the Secchi depth.

cfs: Cubic feet per second, a measure of flow.

Clean Water Act: Growing public awareness and concern for controlling water pollution led to the enactment of the Federal Water Pollution

Control Act Amendments of 1972. As amended in 1977, this law became commonly known as the Clean Water Act. The Act established the basic structure for regulating discharges of pollutants into the waters of the United States. It gives the U.S. EPA the authority to implement pollution control programs such as setting wastewater standards for industry. The Clean Water Act included requirements to set water quality standards for all contaminants in surface waters. It makes it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit is obtained under its provisions. The Act also recognizes the need for planning to address the critical problems posed by nonpoint source pollution.

Comparability: A data quality indicator used by the U.S. EPA that establishes the degree to which different methods, datasets, and/or decisions agree or are similar.

Completeness: A data quality indicator used by the U.S. EPA that establishes the amount of valid data obtained compared to the amount of data planned. Usually expressed as a percentage.

Conductivity: A measure of water's ability to conduct an electric current, directly related to the total dissolved ions in the water. Readings are reported as conductivity at 25 ºC.

Data Analysis: Using monitoring results to answer your question(s) and using your quality control data to evaluate whether you met your data quality goal and objectives.

Data Quality Goals: In the context of water quality monitoring, the characteristics or goals that are determined by a monitoring program to be essential to the usefulness of the data. They would include, but not be limited to, the specification or delineation of the limits of precision of measurements, the completeness of sampling and measurements, the representativeness of sites relative to program objectives, the validity of data and so forth.

Data Users: The group(s) that will apply the data results for some purpose, such as the monitors themselves, government agencies, schools, universities, industries, watershed and/or lake associations, and community groups.

Designated Uses: Uses that federal and/or state law determine to be supported in waters (e.g., swimming, fishing, drinking).

Detection Limit: The lowest concentration of a chemical (parameter) that a given method or piece of equipment can reliably ascertain and report as greater than zero.

Dimictic: A lake that mixes completely twice a year, in the spring and fall.

Dissolved Oxygen (DO): The concentration of free (not chemically combined) molecular oxygen (a gas) dissolved in water, usually expressed in milligrams per liter, parts per million, or percent saturation. Adequate concentrations of dissolved oxygen are necessary for the life of fish and other aquatic organisms and the prevention of offensive odors. DO measurement is considered the most important and commonly employed water quality indicator of a waterbody's ability to support desirable aquatic life.

Drainage Basin (also Watershed): The land area draining into a body of water. The surface area of the lake may be included in the calculation of the drainage basin area.

Ecosystem: A system formed by the interaction of a community of organisms with each other and with the chemical and physical factors making up their environment.

Epilimnion: The upper, wind-mixed layer of a thermally stratified lake. This water is turbulently mixed for at least some portion of the day and because of its exposure to the air, can freely exchange dissolved gases (such as O_2 and CO_2) with the atmosphere.

Equipment or Rinsate Blank: A type of field blank used to check specifically for carryover contamination from reuse of the same sampling equipment. Same as a sampler blank.

Erosion: The loosening and subsequent transport of soil away from its native site. In Vermont, erosion typically results from the removal of vegetation, which is a soil stabilizer.

Euphotic zone: The upper layer of lake water from the surface to the depth that light penetrates through the water. Plants and algae use this zone.

Eutrophic Lake: A general classification of lakes that have a high level of nutrients. Eutrophic lakes are often shallow, warm, seasonally deficient in oxygen in the lower depths of the lake, and supportive of large algal and/or aquatic plant populations.

Eutrophication: The natural aging process of a lake whereby nutrients and sediments increase in the lake over time, increasing its productivity and eventually turning it into a marsh. If the process is accelerated by human-made influences, it is referred to as "cultural eutrophication."

Field Blank: A “clean” sample (e.g., distilled water) that is otherwise treated the same as other samples taken from the field. They are submitted to the analyst with all other samples and are used to detect any contaminants that may be introduced during sample collection, storage, and analysis and transport.

Flow Rate: The rate at which water moves past a given point. In rivers it is usually measured in cubic meters per second (m^3/sec) or cubic feet per second (cfs).

Flow-weighted Mean Concentration: Dividing total mass or load of a pollutant by the total flow.

Free Oxygen: Oxygen in its molecular forms, O_2 (normal diatomic oxygen) or O_3 (ozone), uncombined with other elements. Free oxygen is a requirement of all aerobic organisms.

Geographic Information System (GIS): A computer system that allows for input and manipulation of geographic data to enable researchers to manipulate, analyze and display data or information in a map format.

Geomorphic: Related to the physical properties of the rock, soil, and water in and around a stream.

Global Positioning System (GPS): A satellite based navigation system in which the user has a receiver that calculates the exact latitude and longitude of a given location.

Groundwater: Water that lies beneath the earth's surface in water-filled layers of sand, gravel, clay or cracked rock.

Hot spots: Areas where land use or activities have generated highly contaminated runoff, with concentration of pollutants in excess of those typically found in stormwater.

Hydrograph: A graph of stream flow during a given time frame, such as a season or year.

Hydrology: The study of water, especially its natural occurrence, characteristics, control and conservation.

Hypereutrophic: Refers to a lake or other waterbody characterized by excessive nutrient concentrations such as phosphorus or nitrogen resulting in high productivity. Such waters are often shallow, with algal blooms and periods of oxygen deficiency.

Hypolimnion: The bottom, and most dense, layer of water in a stratified lake. It is typically the coldest layer in the summer and warmest in the winter. It is isolated from wind mixing and typically too dark for much plant photosynthesis to occur.

Impact: A change in the chemical, physical, or biological quality or condition of a waterbody caused by external sources.

Impairment: A detrimental effect on water quality caused by a pollutant that prevents support of a designated use.

Index of Biotic Integrity (IBI): A synthesis of diverse biological information that numerically depicts associations between human influence and biological attributes. It is composed of several biological attributes or “metrics” that are sensitive to changes in biological integrity caused by human activities.

Intermictic: A lake that completely mixes intermittently.

Lake Management: A process that involves study, assessment of problems and decisions on how to care for a lake to support a thriving ecosystem.

Land Use: A type of development and use of a land area, such as agriculture or commercial.

Limnology: The scientific study of lakes.

Load: Refers to the amount of a material, such as phosphorus, transported by a stream during a given period. It reflects the combined contributions of the material in surface runoff and groundwater. The load to a lake is the amount of material transported from its' watershed and from precipitation during a given period.

Lotic: Related to or living in actively flowing water, such as rivers and streams.

Macroinvertebrates: Animals without backbones and large enough to see with the naked eye, such as crayfish, snails and clams. An analysis of the types and numbers of macroinvertebrates can result in a "biological index" that can be a useful indicator of water quality and habitat conditions.

Macrophytes: Rooted aquatic plants that grow in or on the water. They have true roots, flowers, and leaves.

Mesotrophic: A general classification of lakes between the levels of oligotrophic and eutrophic. Mesotrophic lakes have a moderate level of nutrients and are somewhat productive (supportive of moderate amounts of algae and rooted aquatic plants).

Nonpoint Source Pollution: Pollution that comes from a diffuse area (land surface or atmosphere) as opposed to a discharge pipe. Examples are soil erosion and runoff from construction sites or agricultural activities.

Nutrient: A chemical required for growth, development or maintenance by a plant or animal. Examples are nitrogen and phosphorus.

Oligotrophic: A general classification of lakes that have a low level of nutrients. Oligotrophic lakes are usually deep and cold. They usually have a sufficient amount of oxygen at all depths and they support little algal and aquatic plant growth.

Outliers: Data points that lie outside of the normal range of the data. Ideally, outliers must be determined by a statistical test before they can be removed from a dataset.

Parameter: Whatever it is you measure, whether it is physical, chemical or biological.

Phosphorus - A nutrient required by plants, including algae, for growth. In lakes, phosphorus is usually the nutrient in shortest supply relative to other nutrients. The addition of phosphorus to a lake will stimulate plant and algal growth.

Point Source Pollution: Pollution from discharge pipes or outfalls from sources such as wastewater treatment plants or industrial facilities.

Polymictic: A lake that does not form a stable stratification in the summer but tends to mix periodically or continuously throughout the summer via wind and wave action.

ppb: Parts per billion; the same as to micrograms per liter (µg/L).

ppm: Parts per million; the same as to milligrams per liter (mg/L).

Precision: A data quality indicator that measures the level of agreement or variability among a set of repeated measurements, obtained under similar conditions. Usually expressed as a standard deviation in absolute or relative terms.

Protocols: Detailed, written, standardized procedures for field and/or laboratory operations.

QA/QC: QA (quality assurance) is an integrated management system designed to ensure that a product or service meets defined standards of quality with a stated level of confidence. QC (quality control) is the overall system of technical activities designed to measure quality and limit error in a product or service.

Quality Assurance Project Plan (QAPP): A formal written document (plan) that will be followed to achieve a specific project's data quality requirements.

Reach: A segment of a stream or river.

Reagent: A substance used in a chemical reaction to detect, measure, examine or produce other substances.

Relative Percent Difference (RPD): An alternative to standard deviation, expressed as a percentage. Used to determine precision when only two measurement values are available.

Remediation: The reduction, isolation, or removal of environmental contaminants; cleanup.

Replicate Samples: Two or more samples taken at the same time from, and representative of, the same site that are carried through assessment and analytical procedures in an identical manner. Replicate samples measure natural variability and precision of a method, monitor and/or analyst.

Representativeness: The degree to which data accurately and precisely portray the actual or true environmental condition measured.

Riparian: A term used to describe the shoreland area of lakes, ponds and streams.

Sampler Blank: See Equipment or Rinsate Blank.

Secchi Disk: A white and black disk 8 inches (20 cm) in diameter used to measure transparency of water. It is lowered into the water on the shaded side of the boat until it can no longer be seen, then raised back up until it can be seen once again and that depth is then recorded as the Secchi depth.

Sediment: Bottom material in a lake that has been deposited after the formation of a lake basin. Sediment results from the accumulation of decomposing remains of aquatic organisms, chemical precipitation of dissolved minerals, and erosion of surrounding lands. Sediment particles may also be suspended in the water.

Sedimentation: The sinking of silt, algae, and other particles through the lake water column and their deposition on the lake bottom (where they form sediment). Sedimentation is an important process in the life of a lake, transferring nutrients throughout the lake's layers and providing a critical link between surface algae and bottom-dwelling organisms.

Spiked Samples: Samples to which a known concentration of the target parameter (e.g., phosphorus) has been added. When analyzed, the difference between an environmental sample and the concentration in a spiked sample should be equivalent to the amount added to the spiked sample. Used to measure the accuracy of analytical methods.

Split Sample: A sample that has been equally divided into two or more subsamples and submitted to different analysts or laboratories. Used to measure the precision of analytical methods.

Standard Deviation: Used to determine precision. The most common calculation used to measure the range of variation among repeated measurements. Expressed by the positive square root of the variance of the measurements.

Stratification: The formation of temperature zones in deep lakes during the summer. These zones are referred to as the epilimnion (warm upper region), hypolimnion (cold lower region), and metalimnion (thin boundary between the other two layers).

Taxon (Pl. taxa): A group into which related organisms are assigned according to the principles of organization (taxonomy), e.g., species, genus, family, order, class and phylum.

Titration: A method of calculating the concentration of a dissolved substance by adding quantities of a reagent of known concentration to a known volume of test solution until a reaction occurs.

TMDL (Total Maximum Daily Load): Refers to the Clean Water Act's Section 303(d) requirements. A calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources.

Total Nitrogen: The total amount of nitrogen that is contained in the water column.

Total Phosphorus: The total amount of phosphorus dissolved in solution (reactive) and in particulate form.

Total Suspended Solids (TSS): The total amount of particulate matter that is suspended in the water column.

Toxic: Lethal concentration, which may refer to conditions in a waterbody or the concentration of a particular pollutant.

Trophic State: A relative level of productivity. Three trophic states of Vermont lakes are eutrophic, mesotrophic and oligotrophic.

True Value: A value that has been sufficiently well established to be useful for the calibration of instruments and the evaluation of assessment methods. Used to determine accuracy.

Turbidity: A measurement of water clarity. High turbidity (low water clarity) is caused by suspended particles such as silt, soil or algae that reduce light penetration.

Variance: A statistical term used to indicate variability.

Water Column: Water contained in the waterbody. A conceptual column of water from a lake's surface to its bottom sediments.

Water Quality Data: Chemical, biological, and physical measurements or observations of the characteristics of surface and ground waters.

Water Quality Monitoring: An integrated activity for evaluating the physical, chemical, and biological character of water in relation to human health, ecological conditions and designated water uses.

Watershed (also Drainage Basin): The land area draining into a body of water. The surface area of the lake may be included in the calculation of the drainage basin area.

Wetland: An area that is inundated by surface or groundwater with a frequency sufficient to support significant vegetation or aquatic life dependent on saturated or seasonally saturated soil conditions for growth and reproduction.

Winkler Method: A method for measuring the amount of dissolved oxygen in a sample of water using reagents to fix or preserve the sample and titration to create a color change that indicates the amount of dissolved oxygen in the sample.

Zooplankton: Small aquatic animals that are often microscopic in size and usually capable of mobility.